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RESEARCH INSIGHTS

The Strategic Importance of Linux From Edge to Cloud

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Contents

Introduction

As businesses race to stay competitive in increasingly complex and rapidly changing markets, their technology choices have become crucial. Within this context, the operating system plays a critical role, as it ties together infrastructure, applications, security posture, and continuous innovation efforts. Once an afterthought, the operating system now shapes how efficiently data is processed, how quickly new services are deployed, and how reliably critical workloads can scale from edge to cloud.

Among available operating systems, Linux has become the de facto standard. Known for its flexibility, ubiquity, and open source community, Linux has long been a preferred foundation for major cloud providers, on-premises servers, and embedded devices. However, our latest research reveals that its role is far more central and forward-looking than traditional assumptions would suggest. Due to its close ties to mission-critical technologies, such as application containers and AI-driven applications and workloads, Linux can no longer be seen as a "silent enabler." Instead, it has become a strategic platform that aligns with emerging business needs, bridging legacy infrastructures with modern, cloud-native architectures.

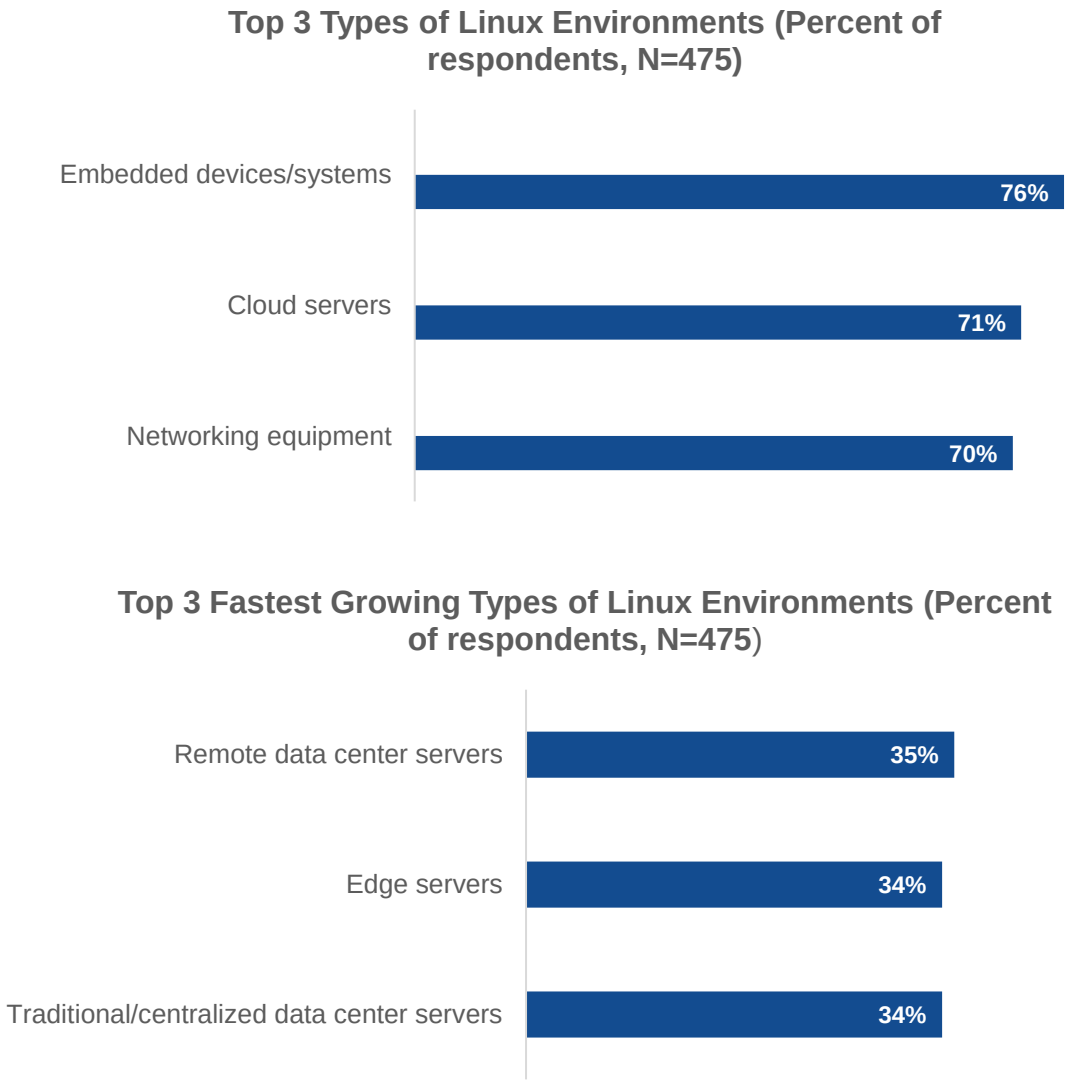
In a recent research study by Informa TechTarget's Enterprise Strategy Group of 475 IT decision-makers, application developers and IT operators alike acknowledge Linux's evolving strategic significance. Organizations are not only using Linux as a reliable and stable OS; they are customizing distributions to meet unique security, performance, and compatibility requirements. They recognize the importance of choosing Linux vendors that can innovate rapidly, provide comprehensive long-term support, and offer specialized capabilities to power workloads at any scale. From real-time data processing at retail point-of-sale (POS) terminals to AI inference on factory floors and distributed microservices spanning global markets, Linux's adaptability is helping companies successfully compete in the marketplace amid complexity and change.

In this research report, we delve into the strategic importance of Linux from edge to cloud, providing insights into Linux selection criteria, how Linux distributions can support evolving workloads, and what key factors—such as security, performance, and manageability—matter most. We will explore how Linux forms the foundation for critical technology trends, from containers and Kubernetes to AI and hybrid cloud strategies, and detail how businesses can harness Linux's full potential to drive efficiency, innovation, and long-term resilience.

The Rapid Rise of Linux

Linux is everywhere, powering embedded devices such as cloud services and networking equipment, while at the same time showing rapid growth in remote and traditional data center servers as well as edge servers. These trends highlight Linux's increasing importance as the platform of choice for edge-to-cloud scenarios. In fact, 89% of survey respondents said it is important that their Linux systems function seamlessly and consistently, from edge environments to large, centralized cloud data centers. Here, "edge-to-cloud" means managing Linux-based systems and workloads smoothly across a spectrum of environments, from small, resource-constrained edge devices running various IoT applications to expansive cloud infrastructures. Figure 1 highlights the environments where Linux use is most common, as well as the environments where use is expected to grow.

Figure 1. Current vs. Planned Linux Deployment

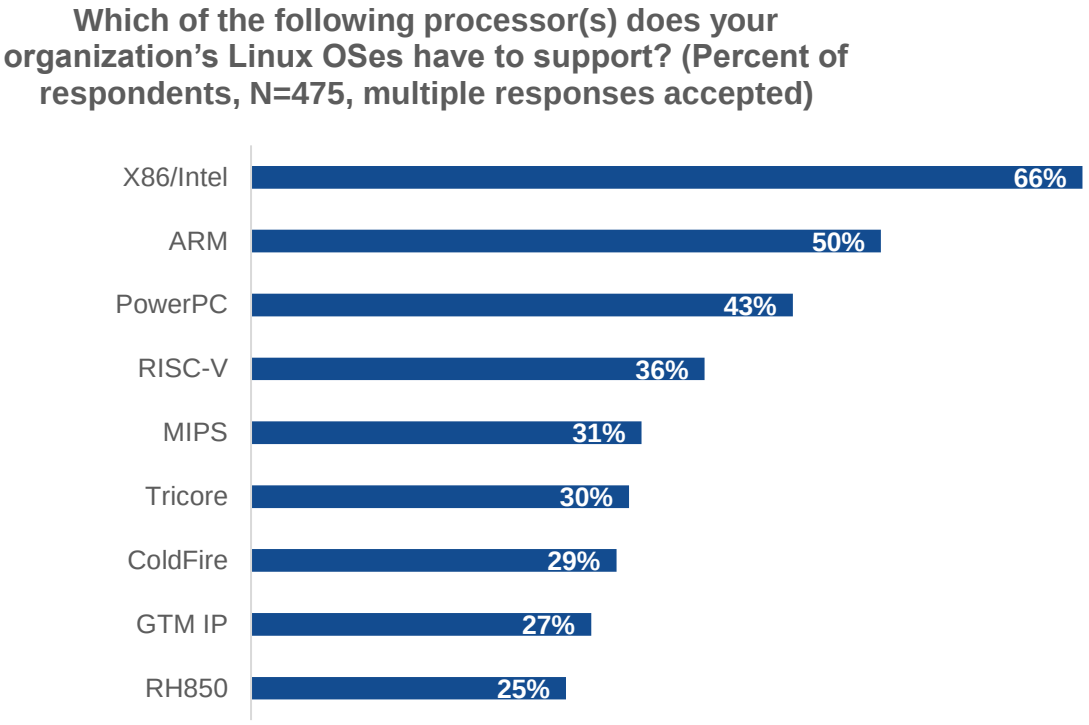


Source: Enterprise Strategy Group, a division of Informa TechTarget

Hybrid Is Today's Modus Operandi

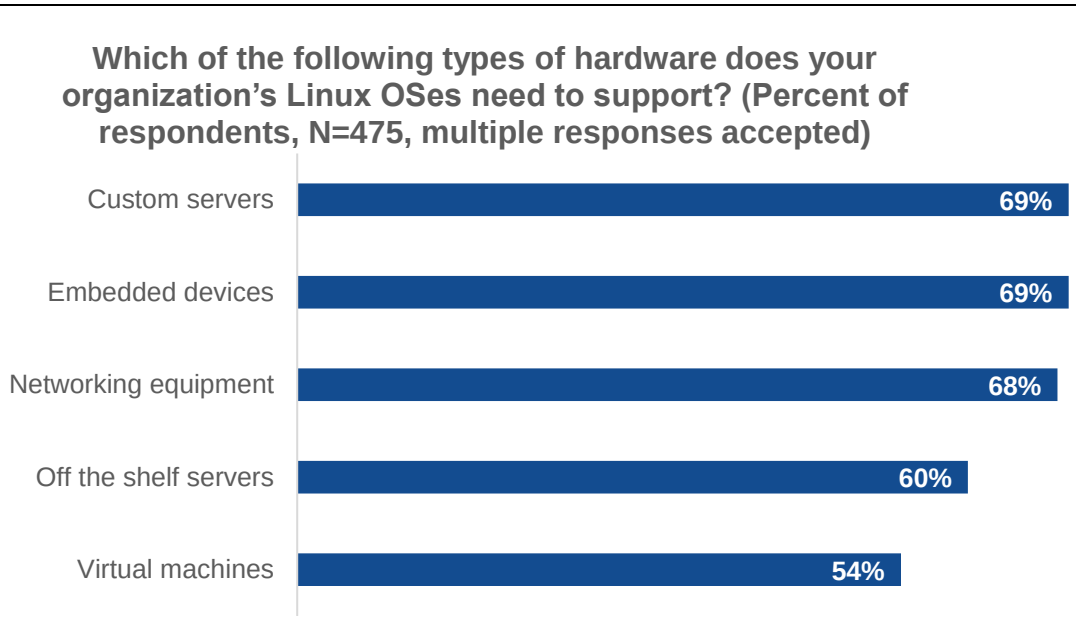
More than half (55%) of surveyed organizations have adopted a hybrid cloud strategy, and among those relying on on-premises infrastructure or hybrid cloud as their primary data center, 95% develop applications that can run in locations beyond traditional data center boundaries. This trend—encompassing public clouds, regional data centers, and edge environments—underscores the need for Linux to support a broad range of devices, various CPU architectures, and differing network conditions (see Figures 2 and 3). Ensuring reliable performance, compatibility, and security within these constraints for a wide range of applications and workloads (Figure 4) comes with a range of requirements that go beyond what is needed to run in stable, centralized server environments with optimal network connectivity.

Figure 2. Top CPU Types Supported by Linux



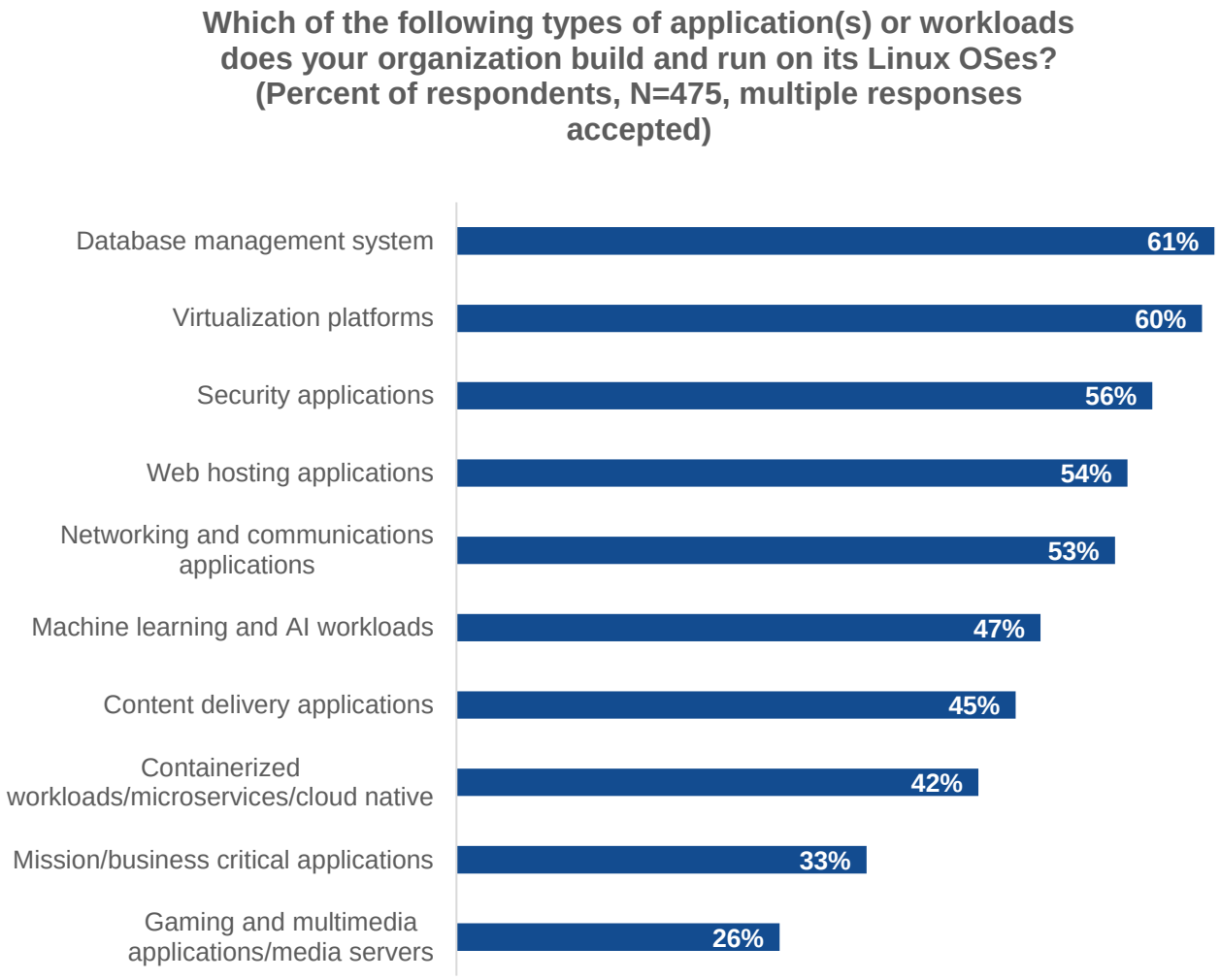
Source: Enterprise Strategy Group, a division of Informa TechTarget

Figure 3. Top Hardware Types Supported by Linux



Source: Enterprise Strategy Group, a division of Informa TechTarget

Figure 4. Top Application Types Running on Linux

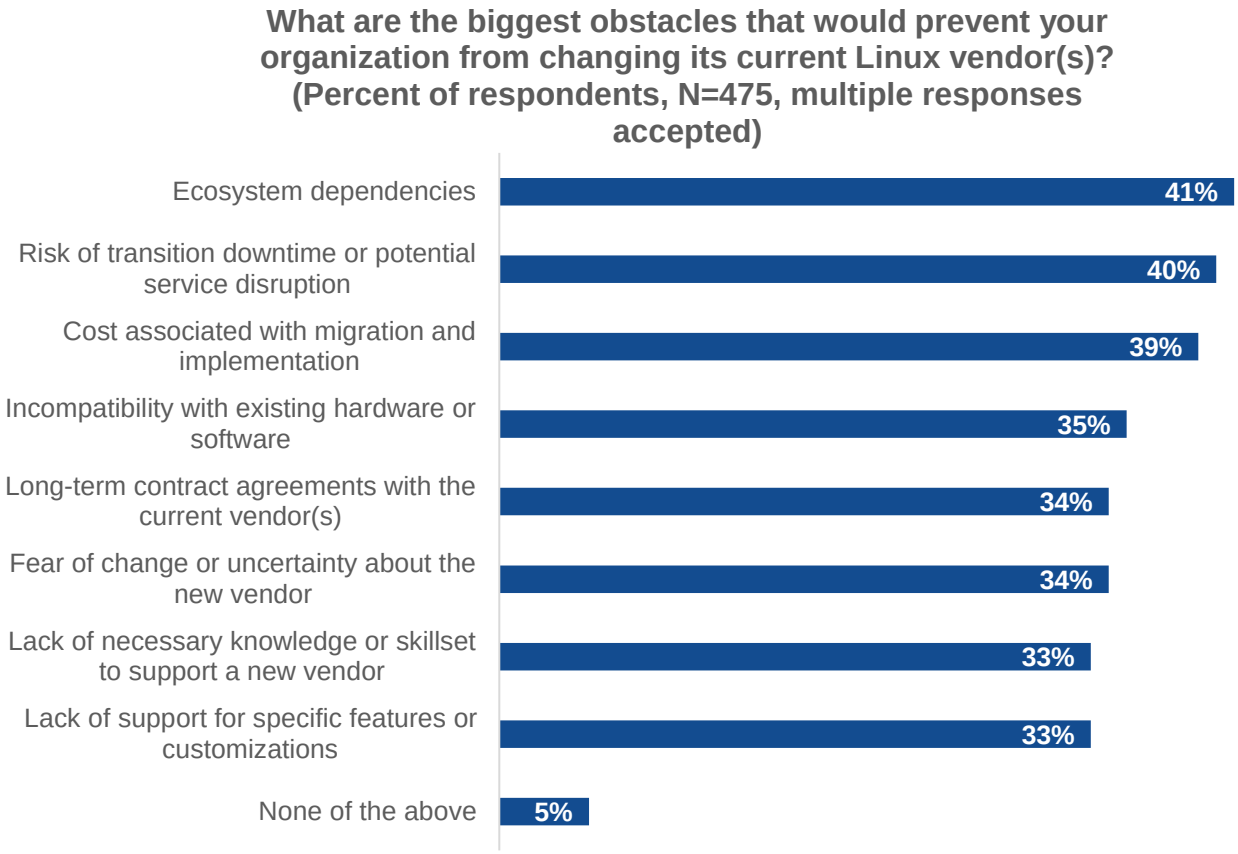


Source: Enterprise Strategy Group, a division of Informa TechTarget

Organizations Are Ready to Make a Change

Transitioning to a different Linux distribution is not a simple, turnkey process. Organizations must consider a broad range of challenges, including ecosystem dependencies, potential outages, migration costs, hardware and software incompatibilities, and long-term vendor contracts (see Figure 5). Still, 75% of surveyed organizations are currently exploring such a switch to enhance performance and meet evolving business needs. This willingness to go through a potentially painful transition underscores the strategic importance of selecting a Linux distribution that aligns with an organization's specific set of use cases.

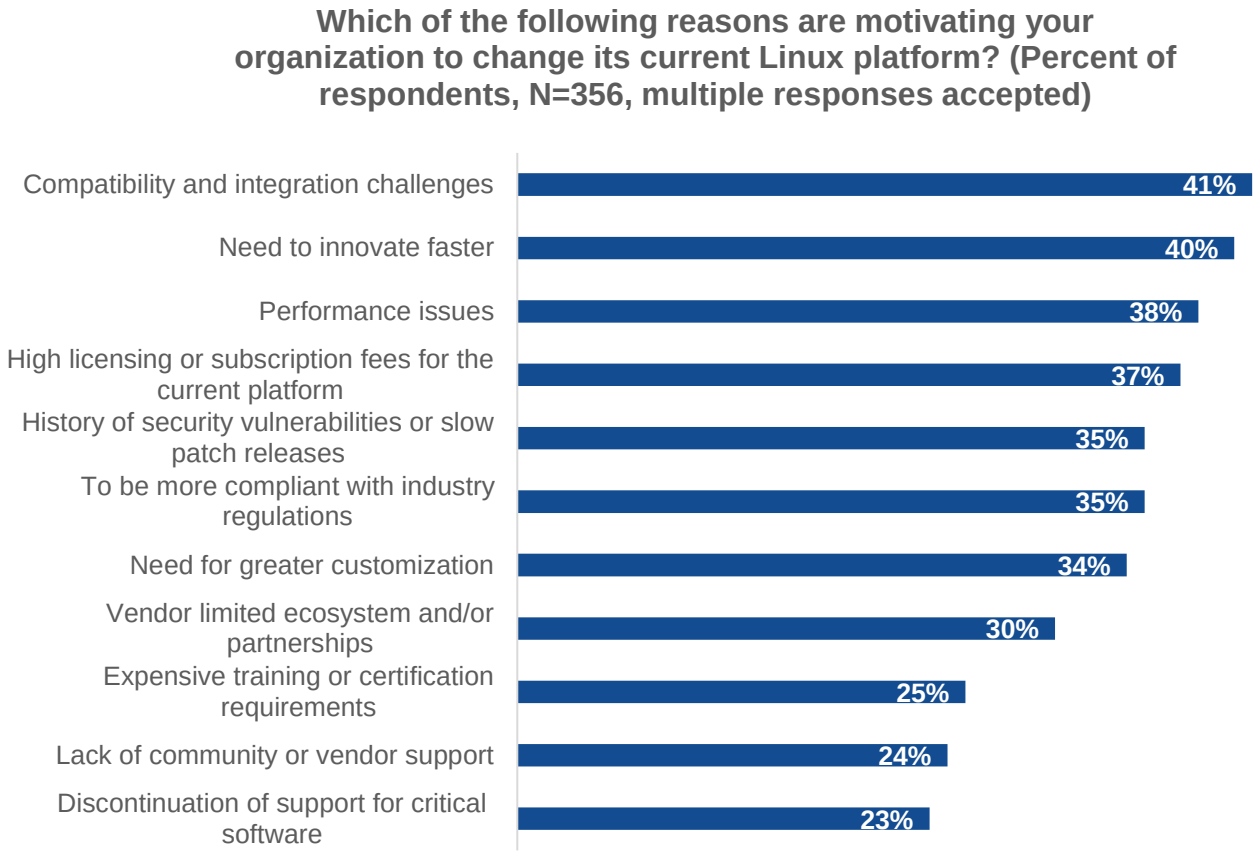
Figure 5. Obstacles Preventing Organizations From Switching to a Different Linux Distribution



Source: Enterprise Strategy Group, a division of Informa TechTarget

When examining the motivations behind an organization's decision to move beyond mere exploration and actively migrate to a new Linux platform, compatibility with existing infrastructure tops the list (see Figure 6). This is hardly surprising, as infrastructure integration is the foundation that must be in place before organizations can turn their focus to innovation. The second most frequently cited reason for changing Linux platforms is the need for faster innovation, which prompts companies to choose distributions capable of quickly integrating new features and updates. Improved performance, which rounds out the top three reasons, can help firms better leverage their hardware, meet increasing workload demands, and maintain consistent, high-quality user experiences. Notably, 62% of organizations already have experience with internally developed Linux platforms, suggesting that many have the technical foundation to navigate these changes effectively.

Figure 6. Reasons for Changing Linux Platforms



Source: Enterprise Strategy Group, a division of Informa TechTarget

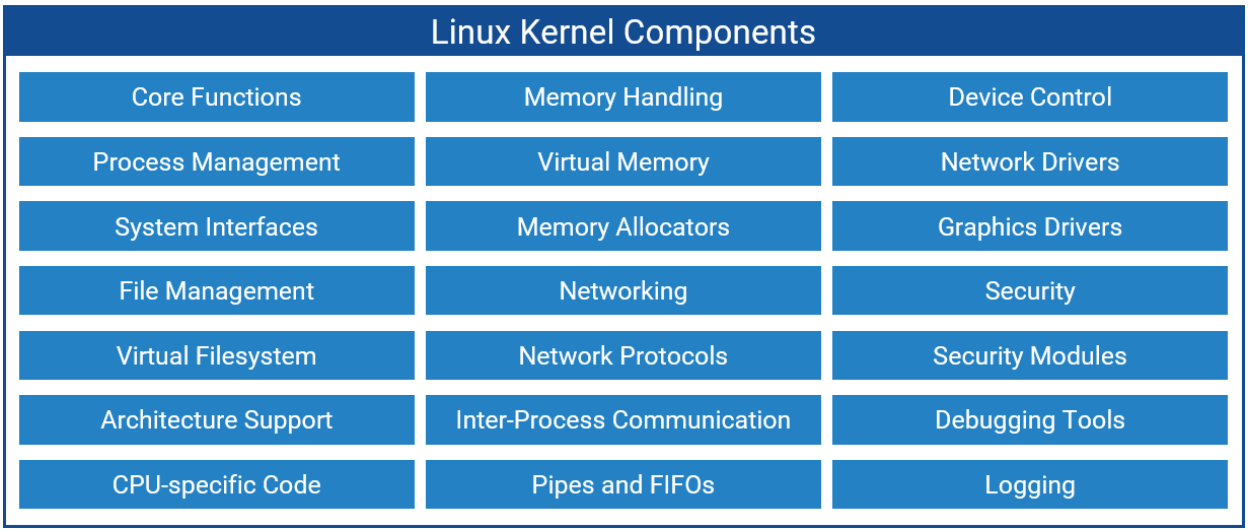
But Are There Really Differences Between Linux Distributions?

When talking about tangible differences between Linux distributions in key areas such as hardware compatibility, adding critical new features, optimizing performance and resiliency, and ensuring security, it is important to understand the areas where Linux distributions can be configured and customized. While the core Linux components, such as kernel APIs, application binary interfaces (ABIs), and key system libraries like the C runtime library need to stay the same to ensure that applications, tools, and device drivers can reliably run across different distributions, there are many areas that can be customized.

Customizing the Linux Kernel

All Linux distributions rely on the Linux kernel—the core of the operating system—to provide software applications with access to the hardware resources they need to run (see Figure 7). Vendors tailor kernel components based on their target use cases, choosing how to handle hardware support, file system performance, security controls, CPU utilization, power management, and networking configurations. They can also customize their distribution's support of containerization, virtualization, and specialized hardware through selective patches and firmware optimizations. This flexibility lets Linux distributions deliver fine-tuned performance for everything from desktop systems to real-time industrial devices and remote edge servers.

Figure 7. Linux Kernel Components

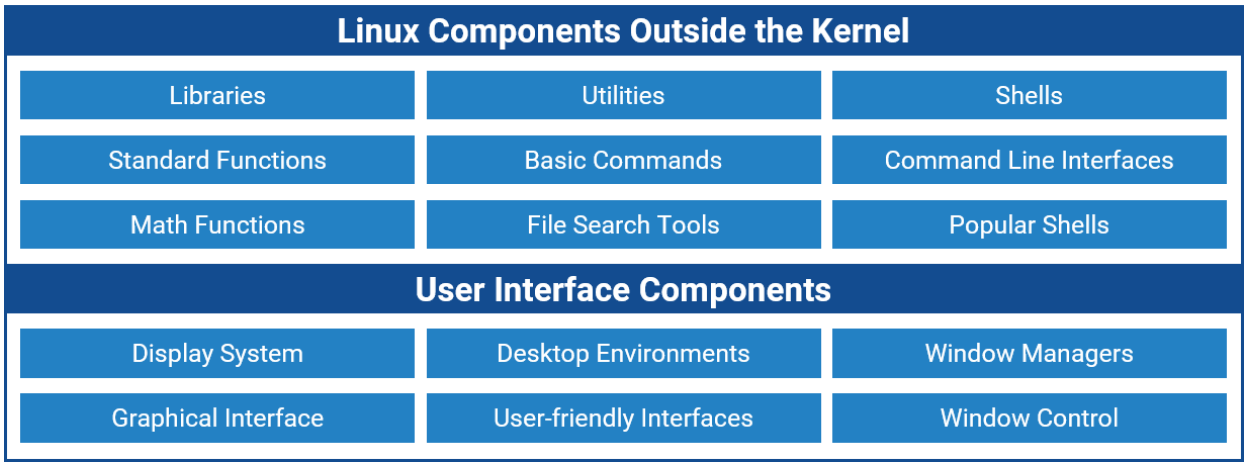


Source: Enterprise Strategy Group, a division of Informa TechTarget

More Customizable Components

Beyond the kernel, Linux distributions can be adjusted to deliver consistent, reliable performance in diverse environments, from sensor-equipped edge devices to multi-region cloud infrastructures (see Figure 8). For example, a retailer could customize system libraries, utilities, and other settings so that POS terminals in the remote stores of a furniture store chain receive the same security patches and interface improvements as servers running analytics in the cloud. This unified, "edge-to-cloud" approach streamlines maintenance, accelerates deployment, and simplifies scaling, ultimately ensuring a stable, high-performing Linux environment. While Linux remains fundamentally open source and compliant with upstream standards, vendors and communities can leverage extensive customization options to align distributions with specific workloads—such as cloud-native applications or AI—without losing compatibility or reliability.

Figure 8. Other Customizable Components



Source: Enterprise Strategy Group, a division of Informa TechTarget

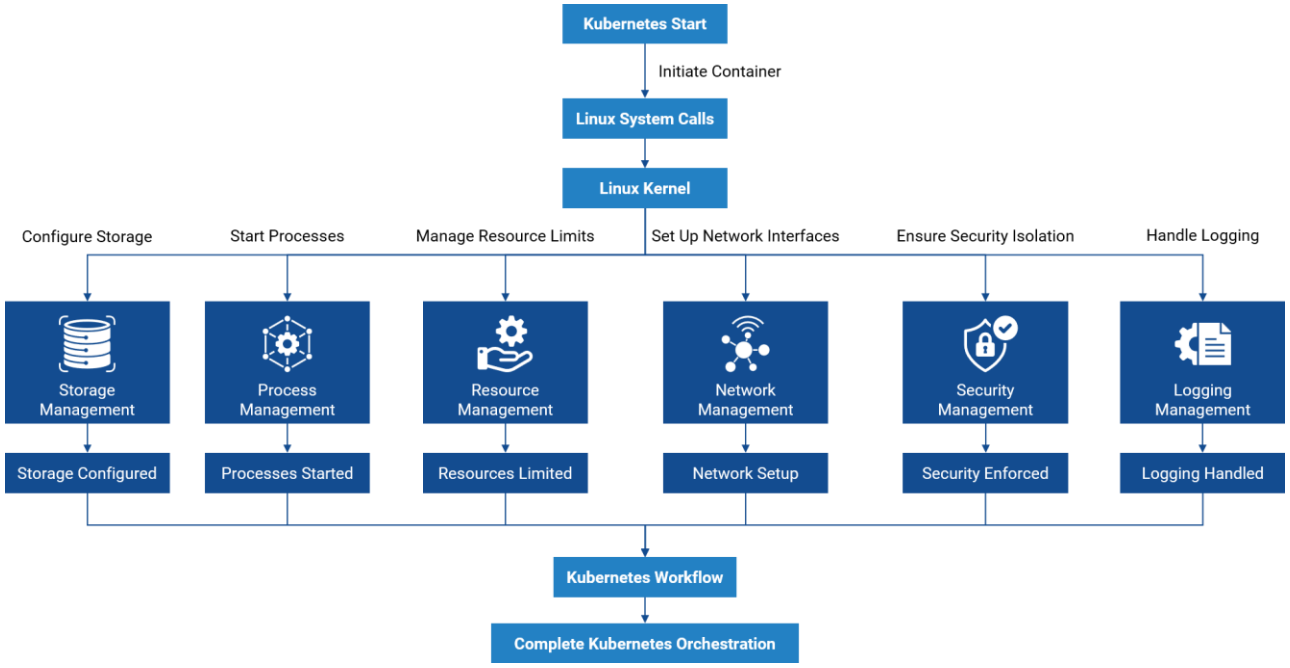
Linux as the Foundation for Critical Technology Trends

As organizations increasingly embrace cloud-native technologies like Kubernetes, as well as developer platforms and AI (including large language models), the role of Linux becomes even more central. With nearly all organizations already using or planning to use these technologies, Linux is the key enabler of organizations turning critical, rapidly evolving technology trends into customer value and, ultimately, business success.

Cloud Native Applications and Kubernetes: Containers Are Part of Linux

Containers—key building blocks of cloud-native applications—rely on Linux to isolate processes, manage resources, and optimize storage usage, all while running on the same underlying operating system. Kubernetes, the leading container orchestration platform, taps directly into Linux networking for functions like service routing, network policies, and load balancing. It also relies on Linux file systems and volume drivers for persistent storage, a must-have for stateful applications. Beyond that, Linux supports minimal distributions tailored for Kubernetes worker nodes, even in specialized environments such as retail POS machines. Each container launch triggers hundreds of Linux system calls to handle everything from storage configuration and process management to resource limits, network interfaces, security isolation, and logging. In essence, Kubernetes orchestration is powered by Linux's foundational capabilities at every layer (see Figure 9).

Figure 9. Kubernetes Orchestration

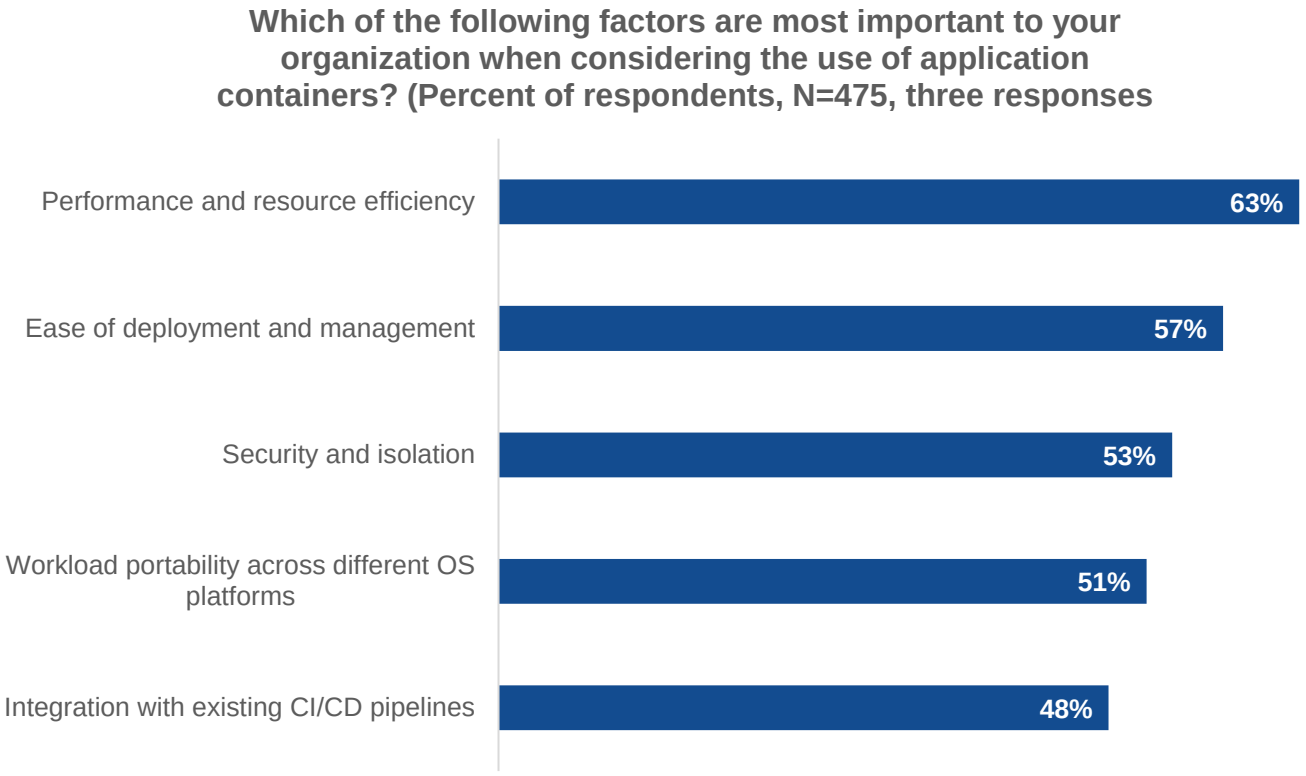


Source: Enterprise Strategy Group, a division of Informa TechTarget

Linux Distributions Can Optimize Container Environments

Because Kubernetes and Linux are deeply intertwined, selecting the right Linux distribution is vital for cloud-native deployments. Different vendors specialize in areas like performance tuning, resource efficiency, network routing, hardware compatibility, security, and compliance to address key customer challenges (see Figure 10). While many distributions focus on large data center optimizations, others cater to environments that are customized to run anywhere from edge to remote data centers—where efficient resource use, broad hardware support, intermittent connectivity, and physical security risks are common challenges.

Figure 10. Most Important Factors When Considering Application Containers



Source: Enterprise Strategy Group, a division of Informa TechTarget

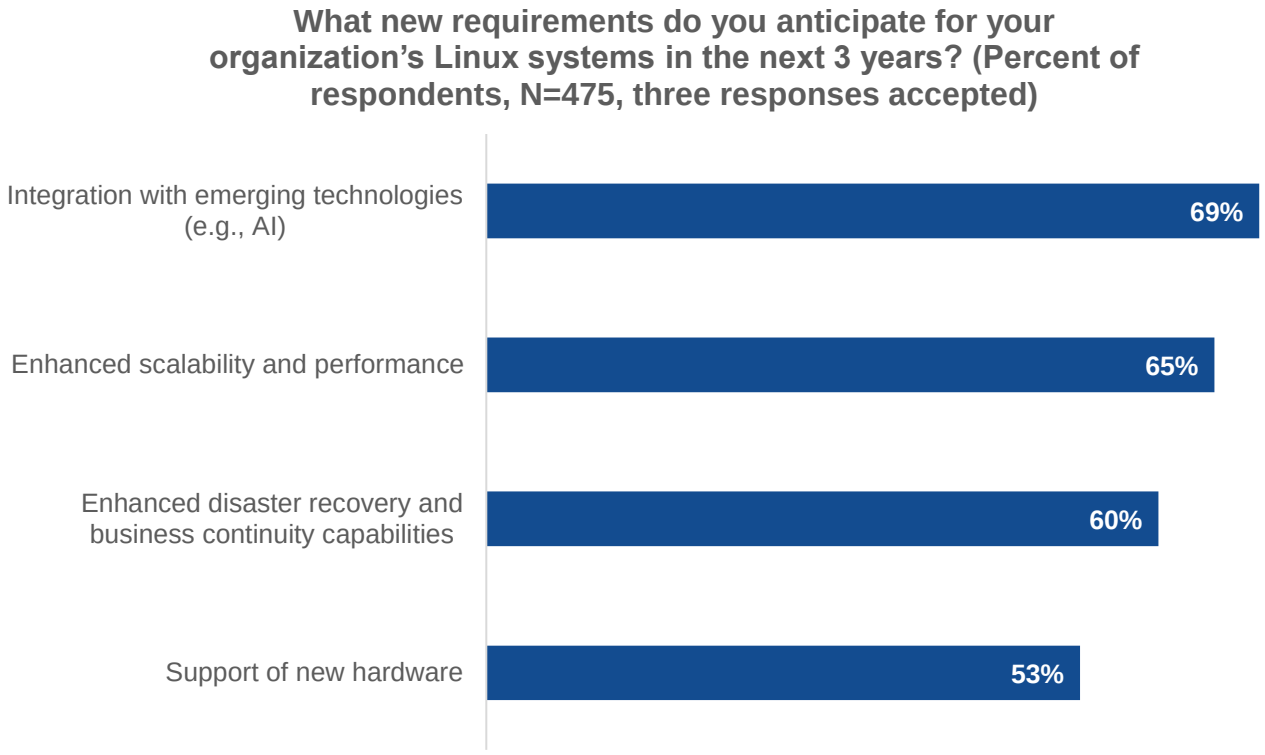
Developers can further refine Linux for their specific workloads, such as enabling real-time processing in industrial systems. By customizing the kernel to include deterministic scheduling,[1] removing unnecessary modules to reduce the attack surface, or integrating industry-specific protocols, organizations can significantly enhance performance, resilience, compatibility, and security for their cloud-native applications running on Kubernetes.

The Impact of Linux on AI Use Cases

AI workloads, especially those involving edge-to-cloud scenarios, push the limits of the operating system due to their often extensive resource hunger (see Figure 11). Consider AI-driven video analytics at the network edge, where Kubernetes orchestrates containerized inference pipelines. Such workloads must frequently synchronize data and model updates with remote data centers, despite slow or unstable connections. By fine-tuning Linux networking parameters—adjusting buffer sizes, re-transmission settings, and keep-alive configurations—organizations can ensure that AI workloads remain stable, responsive, and resilient in less-than-ideal network conditions. This is essential in contexts where even brief downtime or delayed AI insights can have significant safety or operational repercussions.[2]

[1] *Deterministic scheduling* in Linux refers to a scheduling approach where task execution times and order are predictable, ensuring consistent behavior and timing guarantees, often critical for real-time systems.
[2] Please note that these are significantly simplified examples that aim to provide a glimpse into the critical importance of Linux as part of an AI application stack.

Figure 11. Anticipated Linux Requirements in the Next Three Years



Source: Enterprise Strategy Group, a division of Informa TechTarget

Adjusting the Gears: Performance Tuning Linux for Edge to Cloud

Vendors can stand out by fine-tuning their Linux distributions to meet a wide range of scenarios, from high-performance server deployments to remote edge environments. Although Linux is fundamentally open source, commercial vendors and communities have considerable freedom to innovate. By tailoring kernels, utilities, and frameworks to address specific workloads—such as cloud-native applications, AI-driven analytics, or industrial automation—Linux can evolve from a general-purpose platform into a strategic asset. These customizations help organizations optimize for performance, resilience, and scalability, enabling Linux to support their unique operational goals.

The Importance of Operational Consistency Between Edge and Cloud

Using a single, consistent Linux distribution across both edge and cloud environments streamlines operations, cuts complexity, and improves resource efficiency (see Figure 12). With one environment to maintain instead of many, teams can process data faster, better align workloads with available resources, and pivot more quickly to changing demands. This unified approach translates into more effective use of computing resources and speedier decision-making.

Figure 12. Why Organizations Value Seamless Linux Operation Between Edge and Cloud Devices

Source: Enterprise Strategy Group, a division of Informa TechTarget

Adopting a uniform Linux platform across edge and cloud devices also accelerates innovation. Development teams no longer need to rebuild or reconfigure applications for multiple infrastructures, reducing friction and shortening feedback loops. This flexibility makes it easier to turn new ideas into production-ready solutions, enabling companies to innovate at the pace the market demands.

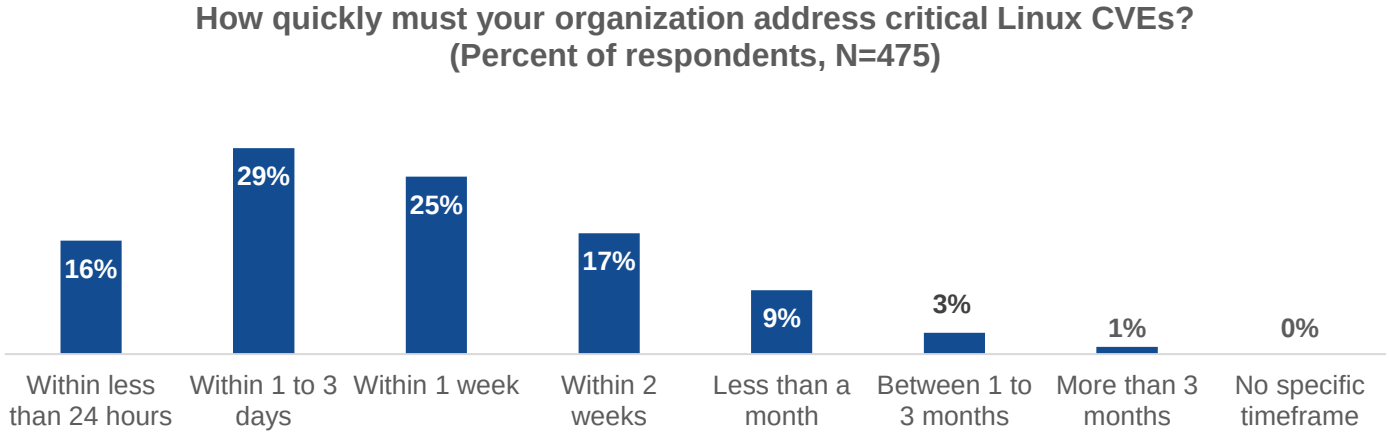
Finally, a single Linux foundation spanning edge and cloud simplifies scaling. Organizations can add devices or expand workloads without overhauling their software stack. Whether tapping into more compute, storage, or networking at the edge or in the cloud, this uniform strategy helps businesses adapt quickly, introduce new services, and adjust strategies—all while preserving operational stability and consistency.

Security Is Always King

Only 16% of organizations can address critical Linux security vulnerabilities within 24 hours, highlighting significant challenges for the rest—especially the 30% that take more than a week to address them (see Figure 13). Given these hurdles, it is unsurprising that security ranks above performance and ease-of-use as the top criterion for selecting new Linux platforms (see Figure 14). In today's world of cloud-native applications, where microservices

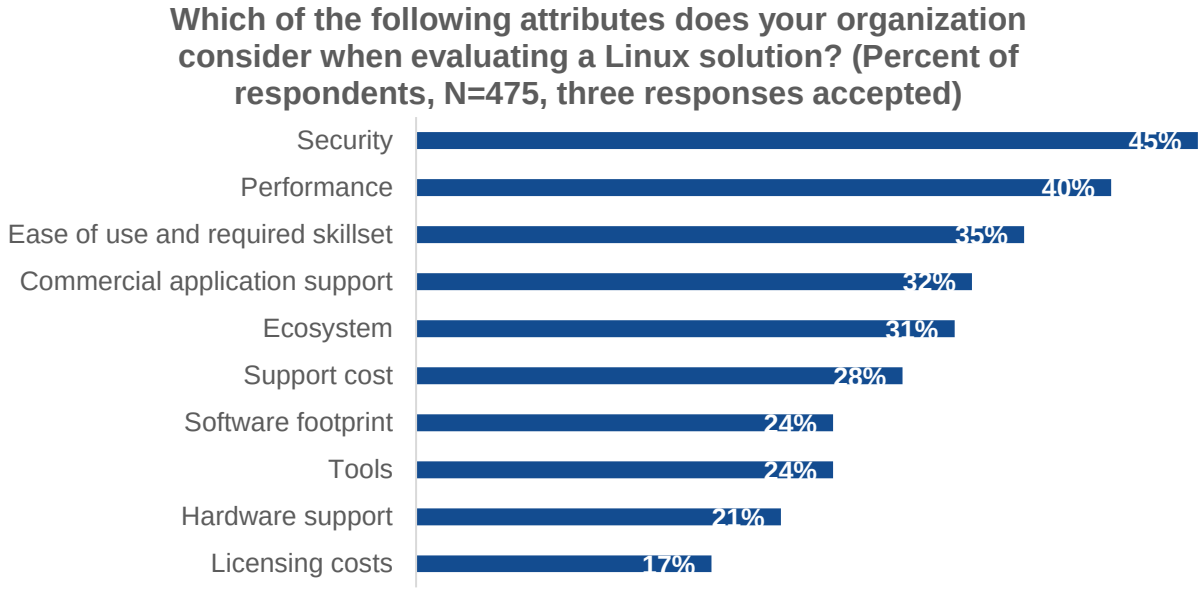
often intermingle with internal and external workloads, a breach can have a massive blast radius. Even the fastest and most user-friendly Linux platform can undermine a company's bottom line and reputation if it fails on security. Reflecting this reality, 63% of organizations plan to upgrade their systems to meet new compliance standards, and 62% intend to implement additional security measures over the next 12 months (see Figure 15).

Figure 13. Timeframe for Addressing Critical Linux Vulnerabilities



Source: Enterprise Strategy Group, a division of Informa TechTarget

Figure 14. Criteria for Evaluating a Linux Solution



Source: Enterprise Strategy Group, a division of Informa TechTarget

Figure 15. How Organizations Plan to Address Increasing Security Requirements and SLAs in the Following 12 Months

Source: Enterprise Strategy Group, a division of Informa TechTarget

Linux for Application-centric Security

Shifting the focus of security from underlying infrastructure to the application layer is crucial, especially for distributed, edge-to-cloud environments. Linux kernel customizations enable tighter isolation between applications, limiting the impact of any single compromise. Dedicated security modules enforce mandatory access control policies, ensuring that developers and users adhere to strict resource usage rules. This granular, application-centric security approach is particularly vital at the edge, where devices could be physically exposed, bandwidth-constrained, and prone to localized threats. Linux security modules help maintain both performance and reliability while minimizing the attack surface across the entire edge-to-cloud continuum.

Speed of Innovation

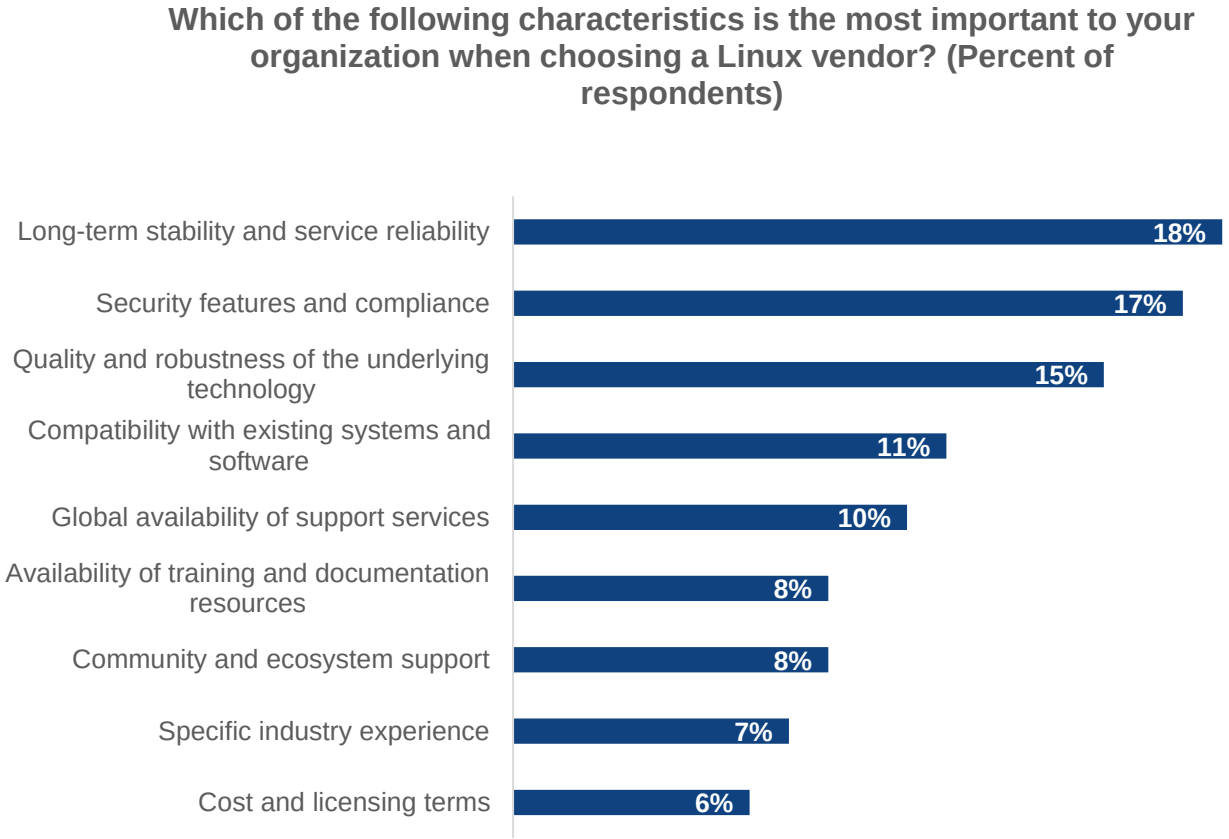
As shown in Figure 6, innovation speed is among the top three reasons organizations consider switching Linux platforms. Linux's growing importance is evident at the edge-to-cloud frontier, where workloads like IoT, 5G, AI, and edge computing demand flexible and quickly adaptable Linux distributions. Organizations expect vendors to support new hardware (e.g., AI-accelerating silicon) or deliver optimized kernel configurations for unique workloads, but 80% of respondents feel their Linux vendors lag behind, struggling to provide timely updates that keep pace with new technologies. By offering preconfigured security modules and compliance features, along with support for distributed and regulated environments, Linux vendors can speed up adoption cycles, helping organizations run innovative workloads quickly and efficiently. Here are a few examples to illustrate the potential impact of preconfigured Linux platforms:

- **Retail.** Linux-based edge nodes at POS terminals can process IoT sensor data in real time, reducing latency for predictive maintenance.
- **Telecom.** 5G private networks can rely on Linux distributions to power virtualized network functions for seamless connectivity.
- **Automotive.** AI-enabled autonomous vehicles depend on lightweight Linux systems for real-time decision-making at the edge while offloading noncritical tasks to the cloud.

Long-term Stability and High-quality Support Matter

While the speed of innovation is vital, our research indicates that long-term stability and service reliability stand as the number one priority for many organizations when selecting their Linux vendors (see Figure 16). Enterprises depend on Linux distributions to power systems that must remain operational and secure for extended periods, often under unpredictable conditions. In these scenarios, consistent performance, rigorous testing, reliable patch delivery, and comprehensive long-term support outweigh the allure of rapid experimentation. By choosing a Linux vendor that excels at providing a stable foundation, businesses can reduce the risk of costly downtime, simplify ongoing maintenance, and ensure that critical applications remain accessible and responsive. This commitment to long-term reliability builds confidence, enabling organizations to innovate at their own pace without sacrificing operational assurance.

Figure 16. Most Important Characteristic of a Linux Vendor



Source: Enterprise Strategy Group, a division of Informa TechTarget

Conclusion

Linux has progressed from a mere building block of IT infrastructure to a strategic enabler of performance, security, and innovation across diverse scenarios. Its edge-to-cloud capabilities underpin everything from AI-driven analytics at remote sites to containerized workloads orchestrated by Kubernetes. Linux's strength lies not just in its technical versatility but in the strategic value it brings, enabling organizations to unify operations, increase efficiency, and respond more quickly to market changes. In today's competitive landscape, treating Linux as a strategic asset rather than as a commodity is becoming a business imperative.

Key Learnings

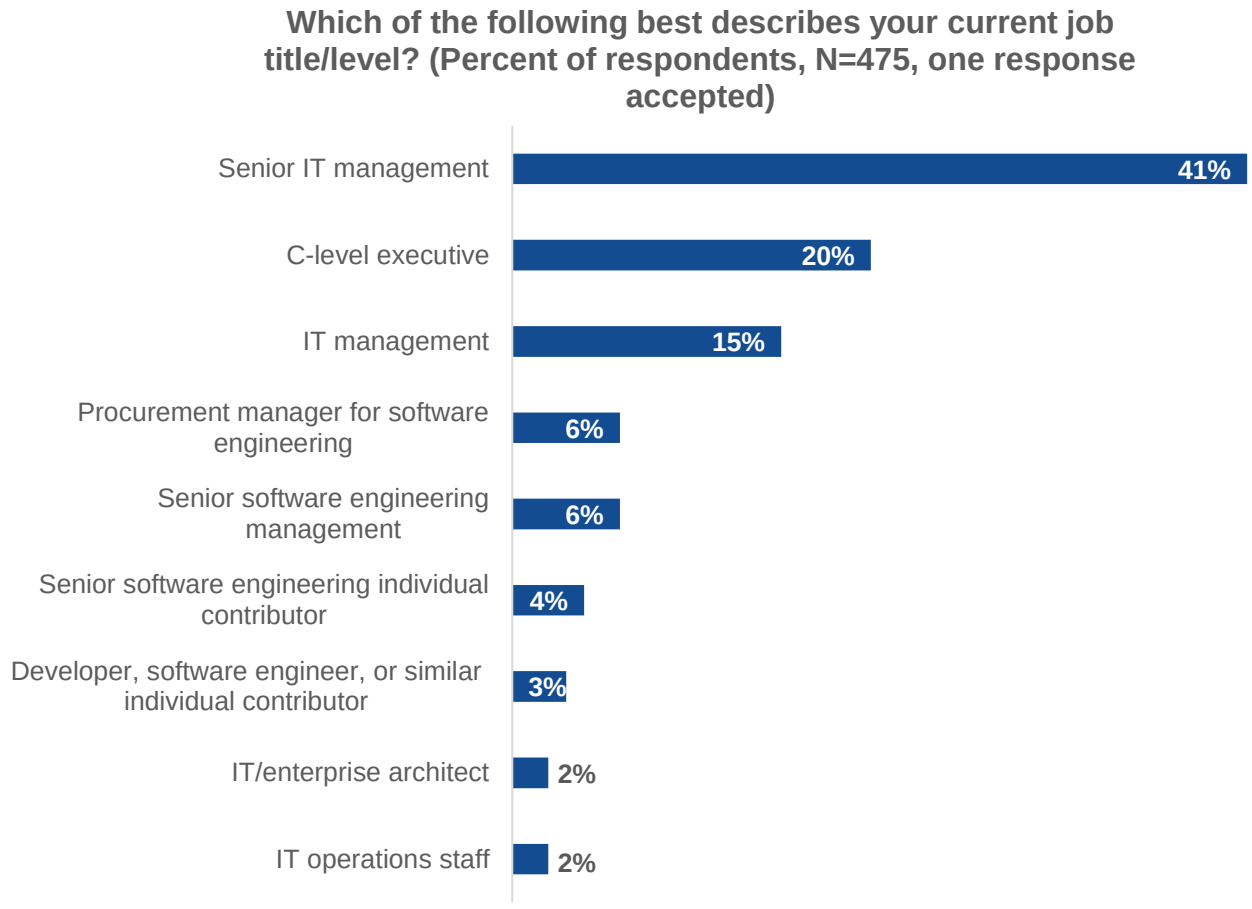
The insights gathered underscore that effective Linux deployments require careful distribution selection and customization tailored to workloads, hardware constraints, and security needs. Long-term stability, high-quality support, and timely updates hold equal, if not greater, importance than raw innovation. By standardizing on a single Linux platform across edge and cloud devices, organizations can streamline operations, accelerate development, scale efficiently, and stay agile. Businesses that integrate Linux into their strategic decision-making position themselves to harness its full potential, transforming a "silent enabler" into a powerful driver of growth and success.

Research Methodology and Demographics

To gather data for this report, Enterprise Strategy Group conducted a comprehensive online survey of 475 technology decision-makers within IT (82%) and application development (18%) teams who have influence over the purchase process for data center compute solutions at their organization, including server operating systems. Represented organizations also currently use Linux OSes in commercial deployments, including, but not limited to, embedded devices (76%), cloud servers (71%), and networking equipment (70%). The survey was fielded between August 22, 2024 and September 6, 2024. The margin of error for this sample size is + or - 4 percentage points at the 95% confidence level. All respondents were provided an incentive to complete the survey in the form of cash awards and/or cash equivalents. Note: Totals in figures and tables throughout this report may not add up to 100% due to rounding.

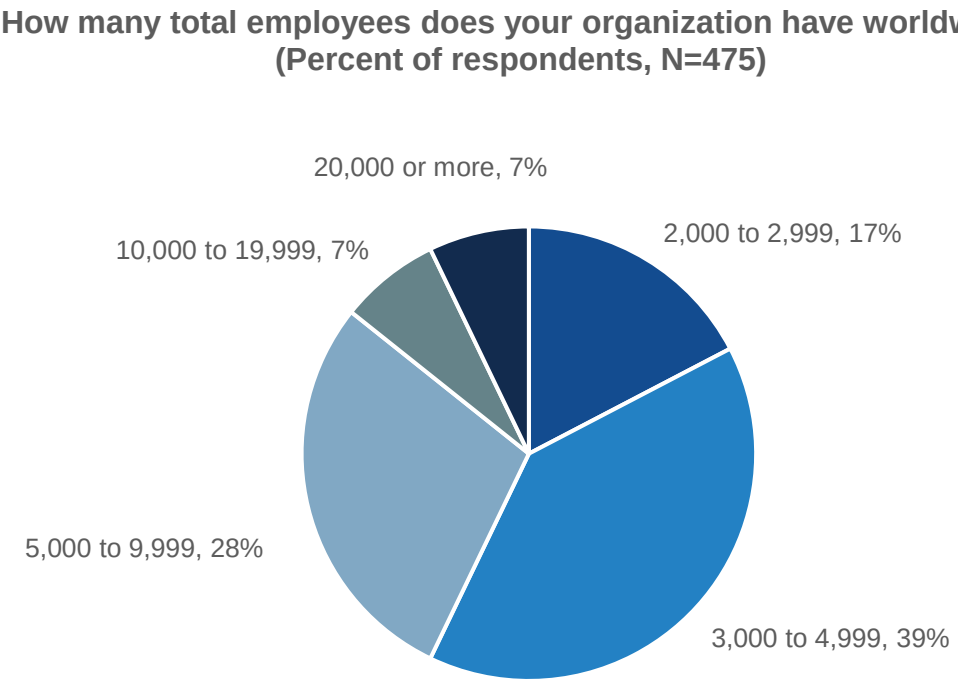
The following figures detail the demographics and firmographics of the respondent base.

Figure 17. Respondents by Title



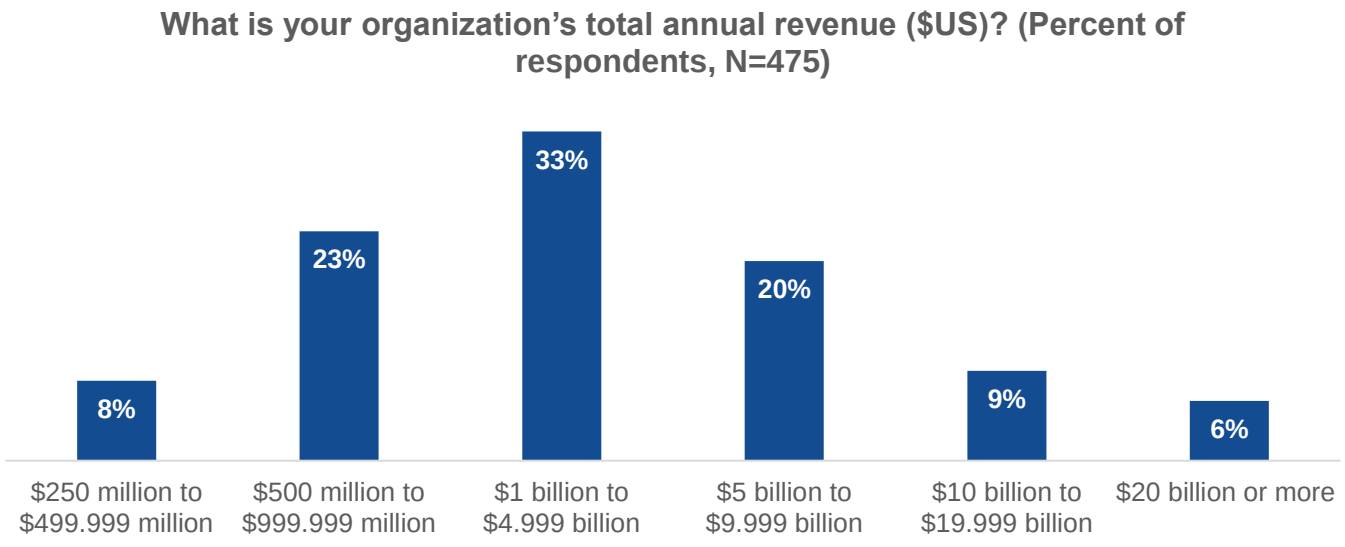
Source: Enterprise Strategy Group, a division of Informa TechTarget

Figure 18. Respondents by Company Size (i.e., Number of Employees)



Source: Enterprise Strategy Group, a division of Informa TechTarget

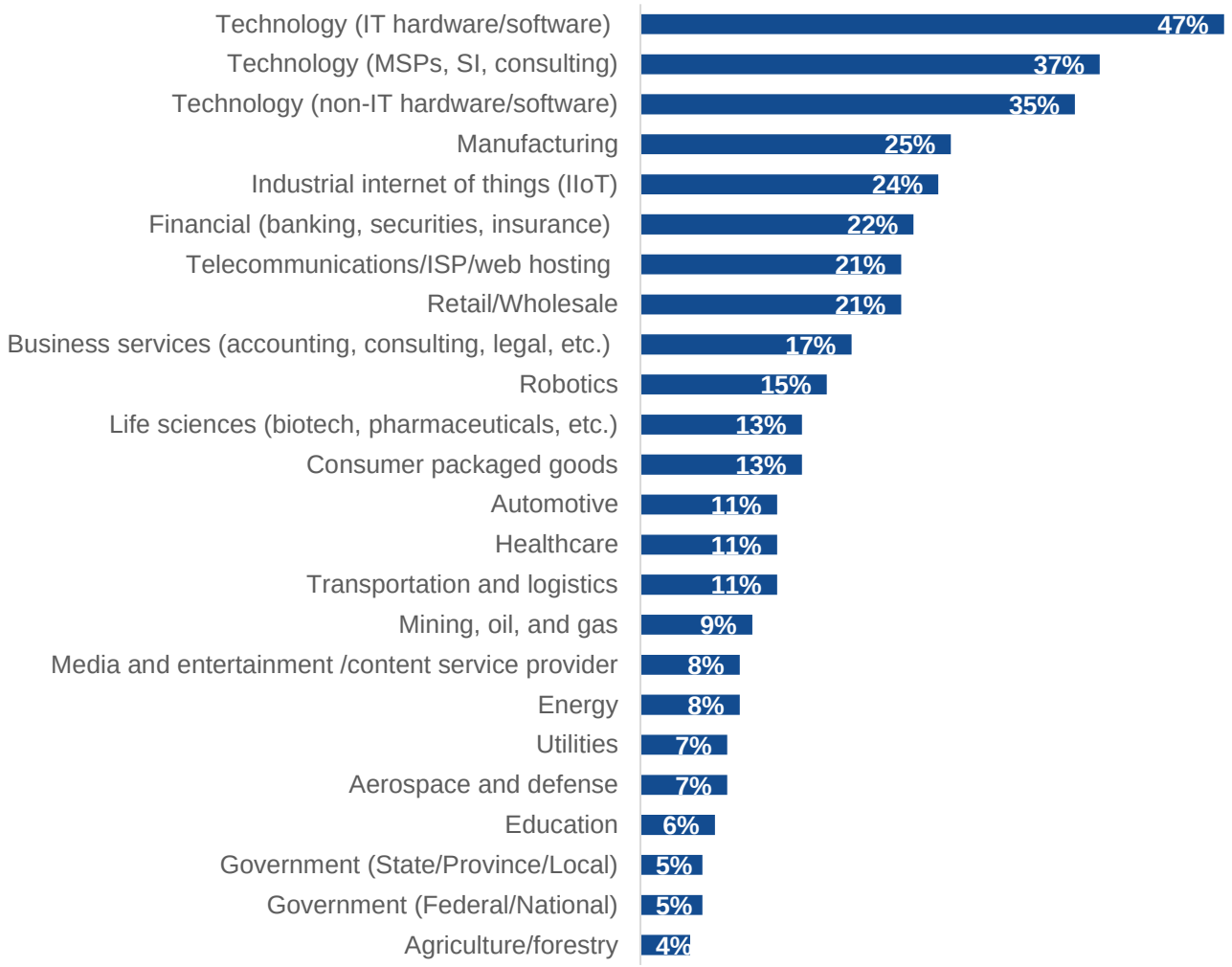
Figure 19. Respondents by Company Size (i.e., Annual Revenue)



Source: Enterprise Strategy Group, a division of Informa TechTarget

Figure 20. Respondents by Industries Targeted

Which of the following industries does your organization serve with its Linux projects? (Percent of respondents, N=475, multiple responses accepted)



Source: Enterprise Strategy Group, a division of Informa TechTarget